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ABSTRACT

The management theories of W. Edwards Deming are known as Total Quality Management (TQM) and advocate building quality into organizational processes rather than analyzing outcomes. Although TQM was originally developed for the workplace, educational reformers have been applying its principles to higher education. The original 14 points of Deming's model can be condensed into the following five points with implications for educational systems: (1) establish a moral purpose of the institution, replacing the traditional priority of "survival of the fittest" science students with an egalitarian inclusiveness; (2) use cooperative efforts instead of individual efforts, increasing the responsibilities of faculty, allowing them more time to perform functions currently done by middle management, and eliminating competition for grades and recognition; (3) stop using product inspection as a means of maintaining quality by reducing or eliminating testing, outcome-based education, and merit pay; (4) continuously improve the system and its product by replacing traditional lecture methods with active learning techniques and implementing the continuous and anonymous assessment of learning; and (5) implement employee education and self-improvement by establishing requirements to maintain tenure. As TQM is implemented in classrooms, it is important that a consensus be built among faculty and that academic freedom be preserved. Contains 14 references. (BCY)

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Implications of the Fourteen Points of Total Quality Management (TQM) for Science Education

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Presentation made at the 57th Annual Meeting of the Association of Southeastern Biologists, Georgia Southern University, Statesboro, GA, April 11, 1996.

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Implications of the Fourteen Points of Total Quality Management (TQM) for Science Education

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ABSTRACT

Educational reformers are applying Total Quality Management theory. A synopsis of the points of TQM and implications follow. Point #1: Establish a moral purpose of the institution. Implications include replacing the traditional priority on the "survival of the fittest" science students with egalitarian inclusiveness. Points #2, #7, #11, and #14: Use cooperative efforts instead of individual efforts. Implications include increased responsibilities and time spent by faculty to take over functions currently done by middle management and less time for idiosyncratic, basic research. Because TQM theory asserts that individual rewards and recognition undermine team work, eliminate competition for classroom grades and professional recognition. Points #3, #7, #8 and #10: Stop the practice of using inspection of the product to maintain quality. Implications include drastically reducing or eliminating testing, eliminating outcome-based education and merit pay. TQM proposes that grading of students and student evaluations of instructors produce "fear in the work place." Points #4, #5, and #7: Continuously improve the system and its product. Implications include adopting active learning techniques to replace lecture, and to assess learning, continuously and anonymously, as a process rather than teaching. Point #6 and #13: Implement employee education and self-improvement. Implications include requirements to maintain tenure.

INTRODUCTION

W. Edwards Deming (1,2), deceased, was honored for his contributions as a management theorist to the phoenix-like resurgence of postwar Japanese industry and for the recent successes of American corporations such as Ford, General Motors and Motorola. Deming held a Ph.D. in mathematical physics from Yale, but called himself a "consulting statistician," gaining fame for expanding Shewhart's concept of the statistical control of production (1). Some educational reformers (2,3,4,5) have followed Deming's lead and attempted to apply to education the principles of Total Quality Management (also known by the less pejorative term, Continuous Quality Improvement). Deming (2) defined quality as follows: "A service or product possesses quality if it helps somebody and enjoys a good and sustainable market." Seymour (6) thought that colleges must act to have intellectually superior faculty, well-prepared students, and excellent funding for salaries and facilities. But, Seymour thought that to quality was a verb of actior not a noun of outcome. Deming asserted that we should also have a moral purpose and a will to improve those resources continually (1,2,4).

Deming (1,2,4) rejected output-driven systems and, therefore, Peter Drucker's Management by Objectives (7). He likened MBO to "driving by looking in a rear view mirror" and attempting to achieve quality through inspection of the product. "Outcome based education," Deming thought, is an oxymoron that confuses training (teaching

prescribed material to accomplish a goal) with education (the development of reasoning). He gave examples of goal setting by educational institutions that ignored the processes needed to attain them (2). Instead, Deming propounded an Aristotelian distinction between goals as intentions separate from actions, and actions as the sole driving force of improvement (4). Does intent precede action as in MBO, or does action precede intent as in TQM (8)? For Deming, the answer was action! Deming assumed this in favoring process-driven management models that build quality into the product while attempting to achieve "zero defects." Aristotle believed that one did not live a happy life by intending to be virtuous, but by acting virtuously (4).

The term plan-do-check-act (1) expresses a formula for doing quality management. Innovations are planned carefully by teams, changes are tested, the processes are checked statistically for variation, and the changes are carried out. Retesting occurs periodically and efforts for the continuous improvement of processes are made. Considering Deming's training in science, it's not surprising that plan-do-check-act resembles the scientific method!

The Factory Model of Education

Deming's approaches depart from F.W. Taylor's (3,4) nearly century-old "scientific factory model" of mass production. Gray (3) admonished, "Taylorism [as commonly interpreted [1]] is the belief that both the preordained order and the maximization of profits dictate that the fittest should manage as benevolent dictators and that the rest should work . . . consultations between the two groups are discouraged, since these interactions threaten the authority (if not the bloated paychecks) of the managing class." For education, the factory model has led to the replacement of collegiality with a hierarchical management system, especially in small colleges, 2-year colleges, and public schools. The factory model has led to the organization of learning into courses and classes, the assignment of instructors to specific classes and, more recently, the passive, lecture-based learning carried to an extreme in auditorium size classrooms. Drucker (9) said that in a hierarchical management system, teachers would be treated as "assembly line workers" and not as professionals. Collegiate instructors objecting to the idea of management, should reflect on how we are being managed and how our activities could be better managed! Nihilism is not an appropriate response.

Legislators and the public apparently believe firmly in the factory model, hence, hear their cries for senior scientists to get out of their labs and teach first-year students. Since knowledge gained is, for the public, largely an unmeasurable product of higher education and teaching classes is a measurable product, we are being pressured to account for our activities that are being paid for by tax dollars. We should consider that a MBO or TQM, applied as Drucker or Deming conceived them, may be preferable to an otherwise miserable factory model.

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[1]Drucker, however, gives credit to Taylor for the principle of participative management and noted how both managers and unions voiced their opposition to it. This is ironic for participative management is also frequently not done in MBO as Drucker intended. See "Post Capitalist Society," p. 34-40, Harper/Collins, N.Y., 1993, and Aliff (7,10).

	Fourteen Points of Total Quality Management [after Holt (4)]
1.	Establish a purpose for improving the product and service in order to stay in business and provide jobs.
2.	Adopt a new philosophy of leadership and cooperation.
3.	Cease dependence on inspection to achieve quality.
4.	Examine proposed innovations carefully.
5.	Improve constantly.
6.	Train employees on the job.
7.	The aim of leadership is to help people do a better job; leaders facilitate the process changes planned and tested by teams.
8.	Drive out fear and promote respect and trust. [Eliminate *theory x* management, the belief that people must be threatened and cajoled to work. Instead, adopt *theory y* management – the belief that people are motivated intrinsically to do a good job.]
9.	Break down barriers between individuals and departments. Cooperate instead.
10.	Eliminate slogans and exhortations calling for better performance.
11.	Eliminate production quotas and goals. Get rid of Management by Objectives.
12.	Seek joy in work. Eliminate merit pay and its requisite evaluations.
13.	Institute a program of education and self-improvement. [The meaning here is not job training as in #6.]
14.	Everyone in the organization will work to transform the goal-based organization to a process-based one.

Since the Fourteen Points were developed primarily for business use, I propose to distill the 14 points into 5 guiding principles that will be more readily understood and applied by educators.

The Five Guiding Principles and Implications of the Quality Management of Education

1. Establish a Moral Purpose for the Institution

Mission statements should address how the college or university will educate students on the meanings of freedom, slavery, and the benefits of cooperative efforts to remedy the problems of our society (7). A community of learners would replace a community of students, teachers and bosses (10,11).

In Science education, the traditional emphasis on the "survival of the fittest" students

would be replaced by a more egalitarian inclusiveness that will serve populations of students who usually do poorly when learning science. The A.A.A.S. sponsored "Project 2061" is dedicated to this end (12). More interdisciplinary and independent studies would occur. Passive lecture and memorization of principles (covering the subject) by students would be de-emphasized and more active learning experiences, including applications of the scientific method would be included in course work. Project 2061 recommended teaching concepts instead of facts (12,13).

The Teaching Paradigm vs. the Learning Paradigm
[after Barr and Tagg, (11)]

Teaching Paradigm	Learning Paradigm
Transfer Knowledge (atomistic)	Elicit learning by discovery and construction (wholistic)
Assess and improve teaching	Assess and improve learning
Quality of resources	Quality of products
Offer courses	Offer learning environments
Covering material	Specified learning results
Grading or ratings of students and instructors within the class	External (outside the class) and public evaluations of learning

2. Use cooperative efforts instead of individual efforts.

The psychology of TQM asserts that competition and personal awards undermine team work; therefore, they would be eliminated (3,4,5). Instructors would be recognized only for their contributions to teamwork, performance appraisals of faculty by administrators would cease (6). Why? Because TQM theory asserts that such undermine trust and collegiality. Participative management systems including faculty would become extant and hierarchical management systems extinct. Since most faculty are internally motivated to do research, Deming noted that U.S. Nobel prize winners were tenured and therefore "accountable only to themselves" (1), a decrease in idiosyncratic, basic research and an increase in institutionally directed research may occur.

3. Stop the use of inspection to improve students and teachers.

Implications include first the drastic reduction or elimination of block testing and grading of performance (4). Midterm exams and final exams might be eliminated. The Graduate Record Exam, for instance, would not be used to test on senior class competence in an ideal TQM institution. Outcome-based (goal-oriented) education would cease. Second, TQM asserts that grading of students, performance appraisals of teachers by administrators, and student evaluations of the performance of instructors produce "fear in the work place." Deming (4) observed, based on his experience with graduate students, that grades were indications of variation within an artificial testing process and useless as

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predictors of performance on the job. Egalitarian reformers (3,4,5,12) have seized upon the principle of eliminating grades in order to enhance the self esteem of minority and other disadvantaged students. Are testing and grading a form of theory x management of students? Gray (3) equated grading and giving awards to students with "social Darwinism" or "cultural elitism," and added that we teach these ethics in schools.

TQM views a 40% graduation rate of entering students this way: there is 40% product and 60% educational "scrap." Scrap in a factory must be thrown away or reworked. Therefore, some of the 60% will be reworked at other institutions such as technical schools where of focus and practicality appeal to these "losers" of education, or, they may be lost to higher education altogether. Quality management asks us to rethink student evaluations and to recommend students to other classes and to employers, not according to accumulated grades, but on the faculty member's reports of the quality of the student's performance.

4. Continuously improve the system and its products.

Continuous improvements of the processes of learning would replace attempts to improve teaching techniques as a focus of the community. Innovations would be planned, tested, and retested. Learning by students would be assessed continuously and anonymously (14). Administrators would assess the processes of learning rather than teaching personae (14).

Another thrust of TQM is the reduction of variations in learning processes. That idea, which Deming opposed in educational settings (1), can be misapplied to either homogenize instructional technique or attempt to arrive at one tested, documented method. Such misapplications are not only inimical to academic freedom, but also to effective teaching methods that may be confrontational or requiring significant effort by students.

5. Implement employee education or self-improvement.

Deming (1,2) encouraged acquiring both job skills training and an education that improves reasoning (see Deming's points #6 and #13). Would tenured faculty be compelled to participate? Learning is lifelong – right? The information age will cause profound changes in education. Therefore, periodic "tenure reviews" will be implemented under TQM. Distance learning may compel us to put at least a part of our courses on the "World Wide Web" and CD-ROM. Not only are the challenges perilous to our academic freedom, but we will be challenged to learn anew. The idea is threatening. We can expect to go through a typical cycle of anger, denial, bargaining, depression, acceptance and finally change, just as someone does when one's marriage breaks up and, after the cycle runs its course, one remarries happily. In the learning institutions of the future, we will be learning alongside our students.

Conclusion

In the near future, TQM may be carried out at institutions of higher education due to legislative mandate for reduction in the cost of operations or for philosophical reasons. Where any system of management is applied to faculty, it is important to build consensus on a method of management or faculty may resist those changes passively (7). The inertia of discipline bias must be overcome to do quality management/improvement.

On the other hand, we must agree that the competitive, structure of higher science education that "weeds out" poorer students has produced the finest science, technologies, scientists and applied scientists in the world. If TQM reduces basic, idiosyncratic research and turns our classrooms into warm, fuzzy "learning environments," where the challenge of Socratic instruction becomes a dim echo of the past, then we will fail, not only in the world economy, but in the noble pursuit of knowledge.

A TQM, faithfully applied, is a hopeful, democratic method or organizing institutions of higher education. However, faculty should be ready to defend the traditions of not only dispensing knowledge, but creating it. Academic freedom can be preserved in a managed system, as Drucker and Deming intended.

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